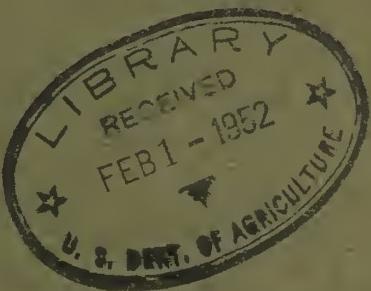


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1951

RESEARCH in the Bureau of Human Nutrition and Home Economics



Agriculture Research Administration
U.S. DEPARTMENT of AGRICULTURE
Washington, D.C., 1951

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ECONOMICS



Research Objectives
Food and Nutrition Inv
Family Economics Inves
Textile and Clothing I
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Index to publications:

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FOREWORD

Current activities of the four research divisions of the Bureau are here reported and a classified list of publications in its various fields of work is given. Within each division, related research is organized under "work projects." Presented for each is pertinent information on the nature and purpose of the work and on objectives of currently active "line projects" - subdivisions of activity under the broader work projects. Included, also, are brief statements about previous work and some accomplishments to date. Much of the Bureau's research is cooperative with other Federal or State agencies. Although this cooperation is indicated it has not been feasible to give details of its extent and nature or to indicate the agencies' contributions toward accomplishments.

Prepared by
Bureau of Human Nutrition and Home Economics
Agricultural Research Administration
United States Department of Agriculture
Washington 25, D. C.

Issued December 1950
Revised December 1951

HE 1106 (rev)

BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS

The Bureau of Human Nutrition and Home Economics, one of six research bureaus comprising the Agricultural Research Administration of the United States Department of Agriculture, was established July 1, 1923, absorbing the Office of Home Economics which had been created in 1915 as an enlargement of the human nutrition investigations authorized by the Congress in 1894.

THE BUREAU'S OBJECTIVES Under the Act of May 15, 1862, establishing the United States Department of Agriculture, the Congress of the United States provides the Bureau with funds each year for -

"....conducting....investigations of the relative utility and economy of agricultural products for food, clothing, and other uses in the home....

"....(conducting) economic investigations, including housing and household buying, as have for their purpose the improvement of the rural home....

"....coordinating nutrition services made available by Federal, State, and other agencies....

"....and for disseminating useful information on these subjects...."

THE BUREAU'S PROGRAM Conducted both independently and through contract and cooperative arrangements with other agencies, the Bureau's work embraces -

Food and Nutrition Investigations, determining factors affecting the table quality of food, principles and methods underlying satisfactory home food preservation and food preparation for home, school, and institutional meals, the composition and nutritive value of various foods, human requirements for nutrients, and nutritional response to diets.

BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS

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2. Family Economics Investigations, collecting and analyzing facts on the quantities consumed and the adequacy and economy of food, clothing, and other goods and services used by various population groups, and developing information basic to programs for improving the living levels of farm families.

Textile and Clothing Investigations, analyzing the properties and design of fabrics, garments, and household textile articles in relation to their selection, use, care, and reconditioning in the home, and studying the utility of fabrics of known composition, construction, and finish.

Housing and Household Equipment Investigations, studying the construction, operation, and performance of household equipment, and developing ways and means of improving designs of rural houses for comfort and efficiency.

Coordination of Nutrition Services made available by Federal, State, and other agencies, including the publishing of a monthly news letter for the use of nutrition committees.

THE BUREAU'S ORGANIZATION Under the general direction of the Office of the Chief, the Bureau's program is carried out through four technical divisions - Food and Nutrition, Family Economics, Textiles and Clothing, Housing and Household Equipment - with common services provided by two specialized groups - those of Administrative Management and of Information.

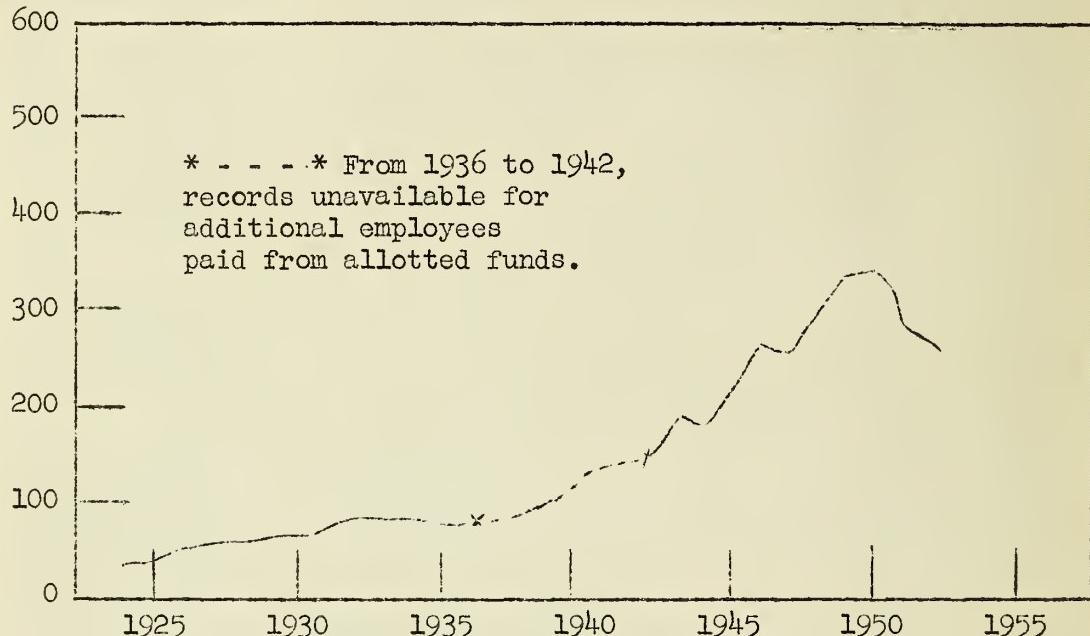
THE BUREAU'S FUNDS Totaling \$1,350,000 for salaries and expenses in the fiscal year 1952, funds of the Bureau are apportioned to various parts of its program as shown in the chart on the opposite page. Work in the food and nutrition division uses somewhat more than 40 percent of these funds, the family economics about 30 percent, textiles and clothing, 16 percent, and the housing and household equipment division, 11 percent.

BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS
 Distribution of Available Funds - 1952

DIVISION	PROJECT	%	SUBJECT
FOOD AND NUTRITION \$560,000	Nutritional requirements and response to diets	15.3	FOOD \$848,700
	Food quality, preparation, and preservation	12.1	
	Composition and nutritive value of food	14.0	
FAMILY ECONOMICS \$425,000	Tables of food composition	5.2	ECONOMICS OF THE HOME \$109,000
	Nutrition programs service	2.2	
	Food consumption and budgets	14.0	
	Family budgets and expenditures for all goods and services	8.1	
	Clothing Consumption	2.0	
TEXTILES AND CLOTHING \$215,000	Selection, design, construction, and care of clothing and household textiles	15.9	CLOTHING \$242,300
HOUSING AND EQUIPMENT \$150,000	Equipment selection, care, use	4.4	SHELTER \$150,000
	Housing needs and design	6.8	

THE BUREAU'S STAFF Composed of home economists trained for research in food, clothing, or housing; men and women expert in chemistry, physics, bacteriology, physiology, economics, or statistics; and persons skilled in presenting scientific and popular information - the Bureau's staff totals about 300 persons for the fiscal year 1952. Man-years of employment over the Bureau's 28 years are shown below:

Man-years



THE BUREAU'S FINDINGS Made available through technical and popular articles, the press and radio, and through bulletins, results of research go to many of this Nation's citizens -

To scientists, providing them with information to use in developing further research -

To educators (extension workers and other teachers), enriching their background of knowledge about nutrition and home economics -

To public leaders, helping them understand better the effect of economic conditions on American homes and the needs of the Nation's families -

To producers and merchants, supplying them facts of value in adapting products and services to consumer needs and desires -

To homemakers, aiding them in applying science and art in the better use of food and fabric and in the better management of their time, money, and energy.

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FOOD AND NUTRITION INVESTIGATIONS

Food and nutrition investigations are basic to providing practical information on the relative utility and economy of foods. They are concerned with improved ways of preparing and preserving foods, with essential nutrients in foods and their utilization by the body, the nutritional requirements of persons of different ages and activities, and with bodily response to different combinations of food.

FOOD QUALITY, PREPARATION, AND PRESERVATION

Purpose and Nature of Work

To investigate the eating and cooking quality of food as affected by household processing and care and by production and marketing practices, and to develop efficient and suitable methods for food preparation and preservation.

Studies seek to relate physical characteristics, chemical properties, histological structure, and the microbiological conditions of foods to the wholesomeness, palatability, yield, and nutritive value of the prepared product. Cooking qualities and palatability, and factors affecting them, are being determined for established as well as for new and experimental varieties and forms of food -- studies usually cooperative with agencies concerned with production and marketing. Data on cooking time and method, yield, and edible quality of foods are being accumulated and in so far as feasible related to factors of composition and market grade. Practical directions are being developed for the preparation, preservation, and storage of fresh and processed foods, and suggestions for food use published to promote expanded, more varied, or more satisfactory use of food supplies by families and institutional users. Results are reported in both technical and popular form.

Currently Active Line Projects

Cooking quality of potatoes. To determine the culinary quality of potatoes of different varieties, grown in different sections of the country, and stored under different conditions, and to classify potatoes as to suitability for common methods of cooking. (Cooperative: BPISAE)

Cooking and edible quality of meat and poultry. Through analysis of existing laboratory data collected since 1926, to determine the relation of cooking time and method, shrinkage, yield, and edible quality of different kinds of meats to market grade and certain aspects of physical and chemical composition.

Utilization and preparation of beef. To determine basic methods for suitable home cooking of different cuts of meats of low market grade. (Contract: Georgia, Illinois, Iowa, Michigan, New York, Texas. Cooperative: Kansas)

Currently Active Line Projects (Cont'd)

Utilization and preparation of eggs. To determine the quality characteristics, including flavor and culinary properties, of shell eggs in relation to market grade, as determined by candling and broken-out appearance and as affected by conditions of storage and other factors. (Contract: Indiana, Louisiana, Washington)

Yields from perishable foods. To assemble available unpublished figures showing yield of edible portion, refuse, and waste from fruits, vegetables, and meats, recorded in connection with various Bureau studies on food preparation and preservation.

Yield and composition data on beef as used by Armed Forces. To aid in planning and evaluating military rations, physical and chemical analyses are being made at various stages from the carcass to the plate. (Supported by a working fund from the Office of the Quartermaster General)

Palatability of foods. To evaluate the palatability of foods or food products when the use of chemicals in production processing may give rise to marketing problems. (Supported by RMA funds -- Title II)

Food uses in home meals. To develop new, improved, and varied home uses for foods not covered by other research in order to meet urgent and temporary food supply situations.

Food uses in institutional meals. To develop new, improved, and varied ways of using abundant foods in residence halls, summer camps, restaurants, hospitals, and other institutions.

Planning and servicing contracts on improved utilization of foods. To coordinate planning and negotiation of contracts for research on improved utilization of foods, monitor work performance, and arrange for analysis of data and for publications as needed.

Bacteriological studies of food spoilage microorganisms. To investigate the influence of certain substances on the heat resistance of food spoilage organisms and, for use in calculating safe processing times, obtain data on the rate of destruction of spoilage organisms in various low-acid foods when heated at different temperatures.

Home canning and freezing of fruits and vegetables. To establish safe and practical canning and freezing procedures which will promote retention of palatability and nutritive value in fruits and vegetables, and undertake heat penetration and bacteriological studies needed to develop processing methods for a number of foods for which directions are not now available. (Cooperative: Texas, Massachusetts)

Brief Summary of Previous Work and Current Needs

Previous research, some of it predating the Bureau's establishment in 1923, has been carried out in five broad areas: (1) developing and standardizing improved methods of home food preservation that provide for higher nutritive value and palatability in foods; (2) improving knowledge of the principles of food preparation; (3) investigating the culinary properties of established as well as new and experimental varieties and forms of foods and the effects of production practices on them; (4) developing recipes for home and institutional meals; and (5) developing or improving methods for evaluating quality and palatability of foods.

Many questions in these fields remain unanswered. More information is needed on the physical and biochemical characteristics of food spoilage organisms and environmental factors affecting their resistance to heat; on safe procedures for the home canning of a number of low-acid foods; on improved methods for the home freezing of foods, especially prepared foods, and for handling, defrosting, and cooking frozen foods; on home pickling procedures which apply and adapt new developments in commercial practice; on improved methods for the home storage, handling, and refrigeration of foods; on edible yield to be expected from perishable foods purchased in wholesale and retail lots on today's market; on the development of improved methods for home baking and for pressure-cooking of meats and vegetables; and on the development of adequate guides, based on relationships between chemical composition, histological structure, and palatability, for appraising the table and working quality of meats, poultry, eggs, fruits, and vegetables.

Examples of Accomplishment

Meat and poultry. Cooking time and shrinkage of beef and lamb have been investigated and related quantitatively to market grade, aging, method of trimming, and temperature of cooking. Results have been reported in the technical literature and applied in cooking directions and recipes for the use of homemakers. Quantitative data from studies of edible yields of meat and poultry are in continued use in setting up buying guides, in estimating nutritive values, and in other practical ways.

A meat thermometer of short sturdy construction, the forerunner of several types of meat thermometers now widely sold to homemakers, was designed by manufacturers because Bureau studies showed that shrinkage can be controlled in part by using a thermometer to indicate internal temperatures as an end point of cooking.

Cooking and palatability studies of turkeys that had been fed fish products led to recommendations that menhaden, white fish, herring meal, and fish oils be omitted from rations fed turkeys from 8 weeks of age until marketing, and that sardine meal be limited to proportions specified for different types of diet.

Turkey parts (halves, quarters, steaks - recently put on the market in fresh and frozen form) of the large type bird, commonly suited only to restaurant and hotel use, were studied to learn the cooking times and procedures which yield the most tender, moist, and palatable product.

Examples of Accomplishment (Cont'd)

Results are incorporated in the bulletin, "Turkey on the table the year round," prepared jointly with the Bureau of Animal Industry and the Poultry Branch of the Production and Marketing Administration.

Dry milks. Directions were developed for home and institution use of dry milk in many dishes ordinarily made without milk. It was found that by adding dry milk powder, quantities of milk solids could be doubled in many dishes and beverages commonly made with fluid milk. These practices allow substantial increase of nutritive value without appreciable increase in the volume of foods or beverages. Formulas for adding nonfat milk solids to cornmeal, other cereals, and soup mixtures have been developed from time to time for emergency feeding.

Eggs. In the 1930's, fundamental studies were made of the leavening power and flavor of eggs as affected by storage and other factors. During World War II, facts were provided through cooperative work to help in developing specifications for storage conditions that would retain the original flavor and cooking quality of spray-dried whole eggs. The storage life of eggs with a moisture content of 3 to 5 percent, for example, was found to be one year when the temperature was below 60° F., but deterioration was pronounced in a month at 86° F. The keeping quality of experimentally dried whole eggs was found to be improved with the addition of certain carbohydrates before spray drying.

Use of egg shells to increase the calcium content of dried eggs was shown to be possible. The presence of shell could not be detected in experimentally produced egg powders containing 0.4 percent of shell finely ground to pass a U. S. No. 400 sieve, when used in scrambled eggs, ice cream, breads, and cakes.

Vegetables. Experimental cooking studies on 70 fresh and 20 brined vegetables made in the 1920's have been the basis of directions for practical home cooking. The research also provided figures on waste in home preparation on 22 vegetables, on the yield of cooked food from one pound of each as purchased, and on fuel needed for cooking. These waste and yield figures are still in use for calculating nutritive values of foods in making diet recommendations. Wartime studies of the effect of various home cooking methods on the nutritive value of potatoes, carrots, peas, and a number of other foods, resulted in standardized methods of cooking which are an important addition to knowledge in this field.

Fruits. Contributing to effective utilization of fresh apples are studies (almost completed) to determine changes in chemical composition, palatability, and cooking quality of orchard samples of six varieties of apples, during controlled storage up to 7 months. Changes found in suitability for eating out of hand, for sauce, or for baked apples will be translated into practical recommendations for improved use of common varieties as marketed. A new popular leaflet on using fresh apples was released in 1951.

Directions for reconstituting and using evaporated apple rings, a new form of dried apples marketed in recent years, have been developed and published to help promote acceptance of apples in this form.

Examples of Accomplishment (Cont'd)

Dry beans and peas. In the late 1920's and 1930's, directions were developed for cooking lentils, beans, soybeans, and peanuts. In a current project, a shorter method of preparing dry beans, using an improved short soak, has been developed which provides cooked beans comparable in palatability and nutritive value to those prepared by the long soaking method previously recommended.

Recipe development. Aid to homemakers through scientific recipe work has been given since the beginning of the Bureau. "Aunt Sammy's radio recipes," a bulletin first issued in 1927 was long a best seller among government publications. In the 1930's, fats for shortening and frying were compared. Other studies included recipes for adding rice polish, wheat germ, and nonfat solids to batters and doughs, soups, and cereal mixes, as well as recipes using rye flour, corn meal, and corn syrup.

Recipe leaflets on tomatoes, green vegetables, potatoes, soya flour and grits, dry beans, dried fruits, and other commodities, developed during World War II, helped promote better use of foods available. Later, in 1947, to meet problems of scarce food supplies, recipes for low-cost main dishes were developed and more than 511 million copies of the resulting publication distributed. Recent accomplishments in promoting better use of plentiful foods have included 200 family-sized recipes developed or tested and 60 menus published in the handbook "Family Fare."

Following recommendations of the Department's commodity advisory committees and stimulated by the interest of the National Restaurant Association, the American Hospital Association, and college food-service managers, a new service of quantity recipes using abundant foods has been instituted. Recipes for these foods in sizes to serve 25, 50, and 100 are originated and tested in the Bureau's laboratories and the products judged and approved by a panel of food specialists and Home economists. Through arrangements with the National Restaurant Association, the recipes are also tested by the Association's testing committees in Chicago, San Francisco, Los Angeles, and Washington, D. C., and by a college food service department. Consumer acceptance tests were also made in the Department of Agriculture cafeterias. Recipes are currently being distributed to about 4,500 food service units.

Development of improved home dehydration procedures. In 1941, when equipment for home canning or freezing foods was in short supply, improved home drying methods were developed to help prevent waste of garden produce grown by some 18 million Victory Gardeners. Existing methods for drying foods were investigated independently and in cooperation with the California, New York, and Texas Agricultural Experiment Stations, and modified procedures for typical vegetables and fruits were developed to provide for better palatability, keeping quality, and nutritive value of home-dehydrated products. Resulting improved methods were published for distribution to families.

Examples of Accomplishment (Cont'd)

Development of improved home canning methods. During World War II, National food conservation programs led 25 million families to can an estimated total of 4 billion quarts of food a year. Spoilage was unduly high, however, chiefly because of inadequate home processing methods. To obtain information needed to put canning practices under home conditions with home equipment on a scientific basis, investigations were carried out independently and in cooperation with the Massachusetts and Texas Agricultural Experiment Stations and with the University of Texas. Findings were the basis for new directions for home canning of meat, chicken, 12 of the most common home-canned low-acid vegetables, and 7 other low-acid foods.

Additional bacteriological studies related to canning are providing further basic data on the heat resistance of organisms causing food spoilage and on the heat treatments required to destroy such organisms in the canning of specific food products. Recent investigations have also shown that certain substances, notably ascorbic acid, sodium pantothenate, and vitamin K₅, have a pronounced effect on the heat resistance of certain bacteria causing spoilage in canned food.

Development of improved home freezing methods. To meet demands for information on preserving foods by freezing, a popular bulletin was published in 1946 providing detailed and tested procedures for freezing 23 fruits and vegetables. This was based on work initiated in 1944 to determine the effect of different methods of home freezing on the palatability, nutritive value, and storage quality of frozen vegetables and fruits. Continued investigations have led to further improvement in methods for preparing and pretreating fruits and vegetables for freezing.

To help evaluate completed and current research on freezing food, a conference was sponsored in 1949 of freezing specialists from institutions in various sections of the country. Based on the recommendations of this group and a critical review of hundreds of research papers and bulletins as well as many unpublished data and further research, a comprehensive bulletin containing directions for the preparation, packaging, and freezing of more than 100 fruit and vegetable products has been issued. A new popular bulletin on home freezing of fruits and vegetables was released in 1951.

Special war services. To meet needs for foods of high keeping quality and low bulk, it was necessary during World War II to evaluate the cooking quality and palatability of commercial and experimental dehydrated foods. Samples of dehydrated raw meat were tested (Lend-Lease project) and found after cooking to be more nearly like fresh meat in quality than precooked dehydrated meat (ARA project). When vacuum-packed and stored at a temperature of 70° F. or lower, such dehydrated raw meat remained in good condition for 8 months. Attainment of a low moisture content was an important factor in the keeping quality of dehydrated raw meat. Another cooperative research project showed that the volume of dehydrated vegetables and soups could be reduced and still leave the products easy to reconstitute, as well as palatable, pleasing in appearance, and suited for storage without refrigeration for a considerable length of time.

NUTRIENTS IN FOOD AND THEIR PHYSIOLOGICAL AVAILABILITY

Purpose and Nature of Work

To determine the quantities and nature of nutrients and related constituents in foods as marketed and as prepared for eating, and the physiological utilization of nutrients from different foods.

Samples of raw and processed foods selected for variety, season, and other variables in relation to their importance in the food supply, are being assayed as needed for energy value and for content of vitamins, proteins, amino acids, fats, fatty acids, carbohydrates, minerals, and other constituents. Biological values obtained with laboratory animals and with human subjects are being compared with results from chemical, physicochemical, or microbiological measurements to determine the degree to which given nutrients are available to nourish the body. Clarification of causes for differences between chemical and appropriate biological measurements are sought through investigations of factors which influence physiological availability, such as the characteristics of nutrients and the influence of interfering substances. Methods for determination of these food constituents and biological criteria for measuring nutritive values are being developed as needed. Results are published in technical and popular form.

Currently Active Line Projects

Digestibility and physiological energy value of selected foods. To appraise the validity of methods used in early studies of digestibility of foods and to determine the physiological energy value of specific foods on which data are lacking. (Cooperative: Iowa)

Folic acid and pantothenic acid. To determine, through laboratory analysis, the quantitative distribution in foods of newly identified nutrients of the vitamin B group.

Vitamin analyses of selected foods from South Pacific Region. To determine the content of ascorbic acid and certain B vitamins in selected foods from islands in the Trust Territory of the Pacific Region. (Contract: Hawaii)

Physiological utilization of ascorbic acid from food sources. To determine the proportion available for human nutrition of chemically-determined ascorbic acid from selected foods fed raw and/or cooked to human subjects. (Contract: Alabama, Indiana, Pennsylvania)

Amino acid content of foods. To determine the quantities of nutritionally essential amino acids in raw, processed, and cooked foods. (In part, contract: Alabama, Arizona)

Problems of microbiological assay of arginine. To develop needed modification of method for microbiological assay of arginine in selected foods.

Currently Active Line Projects (Cont'd)

Effects of processing on cottonseed meal protein. To determine the content and availability of nutritionally essential amino acids and the digestibility and biological value of proteins of cottonseed meals processed under controlled conditions by various methods. (Cooperative: BAI, BAIC, BDI)

Important fatty acids in foods. To determine the quantities of linoleic and arachidonic acids and of other important fatty acids in raw, processed, and cooked foods. (Contract: California, Minnesota, New York)

An unidentified nutrient in eggs. To obtain information on the nature of an unidentified nutrient in eggs, determine whether the nutrient is in the yolk or white, or both, and study its possible relationship to vitamin B₁₂.

Planning and servicing contracts on distribution of nutrients in foods. To coordinate planning and negotiation of contracts for research on the distribution of nutrients in foods, monitor work performance, and arrange for analysis and integration of data and for publications as needed.

Brief Summary of Previous Work and Current Needs

Work initiated in 1894 in the Department of Agriculture was concerned largely with digestibility, energy value, and proximate composition of foods. Research on vitamin and mineral values of food was undertaken after the establishment of the Bureau in 1923. In 1943, the nutritional phases of protein and amino acid investigations of the Bureau of Chemistry were made part of the Bureau's work.

Despite a large volume of research on the composition and nutritive value of foods, many gaps still remain in our information about the more than 40 different nutrients that the body is known to require from its food. Undoubtedly other essential nutrients will be discovered as the science of human nutrition advances. Re-evaluation of currently used values for energy, protein, fat, and carbohydrate is needed for solving problems resulting from international food situations. Recent investigations emphasize the importance of supplementing data on the chemical composition of food with information on the physiological availability of the nutrients, and of investigating the influence of changes in food production and processing on the nutritive value of resulting products. Work also is needed on the development and standardization of accurate and rapid methods for determining newly recognized nutrients, as well as the systematic application of these methods to all important commodities as produced, marketed, and eaten. Up-to-date facts on nutrients in foods and their physiological availability are needed for evaluating dietary habits, for planning adequate diets, and for evaluating and planning production, distribution, and utilization of food supplies.

Examples of Accomplishment

Analyses of a wide variety of foods for energy value, and for water, protein, fat, carbohydrate, and ash content formed the basis of the first tables of composition of American foods. For half a century, figures from tables, published in 1896 and revised and expanded in 1906, have been widely used in textbooks of nutrition. Later analytical work has broadened the base of these early values and added to the number of foods and the number of nutrients on which data are available. Values needed to add folic acid to tables of food composition were reported in 1951.

Studies of human digestibility and metabolic end products of carbohydrates, fats, and proteins in individual foods and in mixed diets provided, at the turn of the century, basic data for translating heat-of-combustion figures into physiological energy values of foods. From these laboratory findings and studies of the importance of various types of food in American diets, the much-used factors, 4, 9, 4, were developed to convert into calorie values grams of protein, fat, and carbohydrate comprising everyday diets.

Protein investigations have given an improved basis for food selection by individuals and households and for administrative decisions in food production and distribution. Among practical guides and principles developed have been: (1) specific factors for converting quantities of nitrogen into protein values; (2) comparative values of the protein quality of major grains and oilseeds, of certain combinations of plant proteins, and of combinations of animal and plant proteins; and (3) measurements of the effect on the quality of grain proteins of the storage of grains under different time, temperature, and container conditions -- a practical problem in the storage of surpluses. Other fundamental accomplishments have been the isolation of a new amino acid (lanthionine), one form of which can replace in part one of the essential amino acids (methionine), and development of methods both chemical and microbiological, for measuring the amino acid content of proteins and foods.

Vitamin A availability to both animals and humans has been found to be more complete than that of pure carotene. Also, the carotene from yellow vegetables such as carrots, sweetpotatoes, and pumpkin has been shown to be markedly less available than that from leafy green ones such as kale or than that in yellow corn. These facts have important implications for agriculture and nutrition, inasmuch as two-thirds of the apparent vitamin A value of diets in the United States is derived from foods of plant origin. During these studies the instability of the then accepted United States Pharmacopoeia reference standard for vitamin A was demonstrated, with the result that a new standard was established by the Committee on the Pharmacopoeia.

HUMAN REQUIREMENTS FOR NUTRIENTS AND NUTRITIONAL RESPONSE TO DIET

Purpose and Nature of Work

To determine the food energy and the kinds and quantities of nutrients needed by individuals under different circumstances; to investigate functions and interrelationships of nutrients as they affect requirements for others; to study the body's response to various food combinations, including diet in relation to nutritional status.

Nutritional requirements of individuals and the response of human subjects both to self-selected diets and to quantitatively controlled intakes of foods, energy value, and nutrients are being studied using anthropometric, physiological, biochemical, and clinical measures. Similar methods are used to investigate functions and interrelationships of nutrients. Studies with human subjects are supplemented by research using experimental animals to provide data on the effect of diet over the entire life span and on successive generations. In addition, studies with experimental animals on different amounts, kinds, and combinations of foods and nutrients are made to delineate problems and to obtain data that may be qualitatively applicable to human beings. Results are published in technical and popular form.

Currently Active Line Projects

Energy expenditures of children. To obtain information on the energy cost of various activities of boys and girls 9 to 11 years of age, in order to estimate their food energy needs. (Cooperative: New York)

Development of a standardized diet and uniform test procedures and establishment of the range of normal biochemical response to their use. To develop for research purposes a standardized diet which can be used in determining more precisely both the requirements of human subjects for essential nutrients and the utilization of such nutrients in common foods, and to establish for normal human subjects, a range of biochemical values of blood and urine that may be expected on the standardized diet.

Influence of nitrogen on amino acid requirements. To determine the effect of different levels and sources of nitrogen on the amino acid requirements for maintenance of the nitrogen balance in the adult rat.

Amino acid requirements of infants and small children. To determine the requirements of infants and small children for the amino acids essential to growth, as a guide to the protein quality needed in their diets. (Contract: New York)

Amino acid requirements of adults. To investigate the requirements of human subjects for the nutritionally important amino acids. (Contract: California, Nebraska)

Currently Active Line Projects (Cont'd)

Thiamine and riboflavin requirements of normal individuals. To determine the thiamine and riboflavin requirements of normal individuals of selected age groups by varying the amounts of these vitamins in controlled diets and comparing the amounts eliminated through feces and urine. (Contract: Illinois, Iowa, Wisconsin)

Human requirements for thiamine and riboflavin. To assemble the published experimental evidence for human requirements for thiamine and riboflavin, evaluate the findings, and summarize them in a report for the benefit of research workers. (Contract: Illinois, Iowa, Wisconsin)

Fatty acid requirements of infants and small children. To determine the amounts and kinds of fatty acids necessary to normal growth and skin development of infants and small children. (Contract: Texas)

Human calcium requirements. To assemble, evaluate, and present for use by research workers and nutritionists available data from laboratory research on calcium and other nutritional requirements of individuals according to age and other factors.

Dietary habits and nutritional status of Negro children. To study changes in food habits and well-being of young Negro children upon entering schools with and without school lunch programs. Food habits and growth are being followed through preschool and early school periods for a total of three years. (Contract: Tennessee)

Food in relation to nutritional status - North Central region. To study the dietary habits and corresponding nutritional well-being of school children (Cooperative: Iowa, Kansas, Ohio) and of women over 30 years of age living under different conditions - alone, in family groups, or in institutions. (Cooperative: Iowa, Michigan, Minnesota, Nebraska, South Dakota)

Food in relation to nutritional status - Western region: Southwestern area. To determine nutritional status in relation to food habits of individuals living at different altitudes in Colorado, Papago Indian children living on a reservation in Arizona, and Spanish-American children living in New Mexico. (Cooperative: Arizona, Colorado, New Mexico)

Food in relation to nutritional status - Western region: California. To determine the nutritional status of older people in relation to the food they eat. (Cooperative: California)

Food in relation to nutritional status - Western region: Intermountain area. To determine the relationship of nutritional status of Utah children with rheumatic fever to the food they eat and to the nutritional status and diets of their parents, and the relationship of the nutritional status to the diets of children born and reared in Idaho. (Cooperative: Idaho, Utah)

Currently Active Line Projects (Cont'd)

Food in relation to nutritional status of adolescents - Western region: Montana and Washington. To study the relationship of nutritional status, diet, water supply, and related factors to dental health of adolescents. (Cooperative: Montana, Washington)

Planning and servicing contracts on human nutritional status and requirements. To coordinate planning and negotiation of contracts for studies of nutritional requirements and responses of humans to diets, monitor work performance, and arrange for analysis of data and for publications as needed.

Brief Summary of Previous Work and Current Needs

Study of human energy requirements dates back to the 1890's when the world-famous Atwater-Rosa-Benedict respiration calorimeter was built by the Department, the first satisfactory instrument developed for direct measurement of the energy expenditure of human beings. Current studies of the energy requirements of children are making use of a respiration chamber and of portable respiration equipment which permits study of energy expenditures for physical activities not feasible in a respiration chamber.

Early in the 1900's, human requirements for calcium, phosphorus, iron, and sulphur were estimated from analyses of the intake and output of these minerals under controlled conditions. From investigations with human subjects initiated in 1937, minimum levels of vitamin A and crystalline carotene necessary to maintain normal night vision were determined. Work started in 1944 in a cooperating State has contributed information on ascorbic acid (vitamin C) requirements of adolescents.

Prior to 1946, the Department cooperated in one small study of the relationship of nutritional status to food eaten. This research, cooperative with health groups in the State, was concerned with the food supply and pellagra incidence among 73 South Carolina farm families. Results were published in 1932. Since 1946 a number of studies of nutrition in relation to self-selected diets among school children, teen-agers, and middle-aged or older persons have been initiated.

There are many gaps in our information on nutritional requirements despite these Departmental studies and work of a similar nature in other laboratories. For example, further information is urgently needed on energy expenditure by children and youth (6 to 18 years) and by adults (40 years and older) in present-day activities, occupations, and machine-controlled operations. Further study is also necessary of nutritional requirements as shown by responses to controlled intakes of food energy, specific amino acids, vitamins, and minerals, and to intakes of various combinations of food and nutrients, both controlled and self-selected.

Examples of Accomplishment

Construction of the Atwater-Rosa-Benedict respiration calorimeter marked the beginning of many studies by numerous investigators of the energy expenditure of persons both in health and disease. Atwater's studies also provided fundamental information which led to the development of simplified apparatus and procedures for estimating energy requirements of people.

The amount of vitamin A needed by young adults has been determined by a study of the quantities of this nutrient required to restore and maintain normal night vision in subjects who had lost it as the result of an experimental diet extremely deficient in vitamin A. These studies were the first to show that it is possible to obtain such quantitative data for vitamin requirements with human subjects. The research stimulated experimental work of a similar nature in this and other countries and helped give a scientific basis for the daily allowance of vitamin A recommended by the Food and Nutrition Board of the National Research Council. The results have also been used in setting up Food and Drug standards for labeling vitamin preparations and food products as sources of vitamin A.

Ascorbic acid requirements of adolescents have been made more definite through controlled feeding experiments that related diet to levels of this vitamin in the blood of about 100 girls and boys, 12 to 19 years of age.

The distribution of nutrients among the day's meals has been found to affect their value to the individual. In a study of 8 types of breakfasts it was learned that when at least one-third of the daily protein allowance was eaten at breakfast, the blood sugar was kept at a desirable, more uniform level than when a meal with less protein was ingested. When the noon meal was meager, breakfast influenced blood sugar levels throughout the day.

Development and use of uniform procedures to obtain comparable dietary and biochemical data in different localities has been promoted by exchanging information at conferences with regional technical committees; by conducting workshops on biochemical techniques and collaborating in the development of improved methods of collecting and appraising dietary data.

Vitamin E deficiency was analyzed in the course of research with rats fed diets short in vitamin E. Some of the young were found to develop eye abnormalities of a kind not previously observed in these laboratory animals. Inasmuch as small prematurely born human infants sometimes develop a serious eye impairment which has recently been linked by ophthalmologists with a shortage of vitamin E, the Bureau's experience in producing a somewhat similar condition in the rat may prove useful to those seeking to investigate further the nature, cause, and prevention in premature infants of the disorder known as retrolental fibroplasia.

Response to various food combinations has been examined. By feeding selected experimental diets to laboratory rats not only over their entire life span but also through successive generations, the Bureau has observed that combinations of food that seem to provide adequately for growth may tend to accentuate certain chronic ailments commonly associated with age.

SCHOOL FEEDING

Purpose and Nature of Work

To (1) develop effective ways of using various foods to help achieve successful administration of the National School Lunch Act which requires that "lunches served by schools participating in the school lunch program under the Act shall meet minimum nutritional requirements prescribed by the Secretary [of Agriculture] on the basis of tested nutritional research;" (2) study the nutritive value of school meals as served to children; (3) investigate factors influencing acceptability of food and meals to children; and (4) evaluate practices in school feeding and their relation to the cost and management of school lunch programs.

Currently Active Line Projects

Large quantity recipes for use in school feeding. To develop suitable recipes using foods desirable for school meals with special emphasis on those in plentiful supply. Consideration is given to acceptability of the food to school children, to the amount and kind of labor needed for preparing and serving meals, and to the nutritive value per serving of each recipe.

Visual aids for school lunch management training programs. To develop slides and filmstrips based on research findings of improved methods for use in training programs for school lunch personnel.

Brief Summary of Previous Work and Current Needs

In 1940 a collection of recipes was prepared to assist in the effective use of foods being supplied to schools by the Federal Government. In 1943 this work was slanted to fit wartime rationing and available food supplies. In September 1946, in cooperation with the Department's cafeterias, 67 recipes to serve 100 were assembled, tested, and published for schools operating under the National School Lunch Program. The following January a special laboratory was set up for use in developing large quantity recipes that would meet the minimum requirements for the type of lunch recommended by the Department (Type A), with particular attention to commodities made available to schools.

In 1945, at the suggestion of a conference of research leaders in child nutrition, pediatrics, public health, institution management, and education, studies were undertaken to learn the characteristics of effective school feeding programs in the consolidated type of school and to develop methods for the study of the nutritional effect of school lunch programs.

More studies are needed to aid in evaluating and developing needed management practices in relation to menu planning, food service, food acceptance, equipment, sanitation, and safety. More work is also needed on the nutritive value of school meals as served and as affected by various methods of large-scale food preparation, menu planning, and management. Research should be initiated to develop practical menu patterns designed to insure adequate nutritive value for school children.

Examples of Accomplishments

The school lunch management studies are the first to relate food management methods to the nutritive value of the school lunch. Results have aided supervisory and managerial personnel in providing more nutritious and acceptable meals at low cost to school children of different ages, and have stimulated study, evaluation, and improvement of local school lunch programs. In addition to stimulating appraisal of management practices, publications have provided practical help on such special problems as storage for school lunch food and supplies, increasing the efficiency of the school lunch kitchen, quantities of food required for serving school lunches, and lists of small equipment needed for the school lunch.

School lunch recipes for special foods have been developed and tested for pupil acceptance. Special work on potatoes, nonfat dry milk, dried whole egg, dried fruit, fish, cheese, tomato paste, peanut butter, honey, and turkey have resulted in recipes on a 100-portion basis, with selected ones in 25- and 50-portion sizes. Yeast and quick bread recipes for use of school lunch cooks and formulas for the use of bakers supplying schools have been developed in the interest of flavorful breads of high nutritive value. These recipes have been published as aids to schools in making greater and more effective use of currently abundant foods, newer kinds of foods unfamiliar to school lunch cooks, and foods nutritionally important to the school lunch.

Recommended research procedures for appraising nutritional aspects of a school lunch program were issued in 1951. Suggestions for carrying out further research of this kind include details regarding the sampling, experimental design of the study, physical examinations, biochemical tests, and dietary records. These were developed in a pilot study carried on in one community by the Bureau in cooperation with the United States Public Health Service and State and local authorities according to a plan outlined several years ago by an Interdepartmental Committee on School Lunches.

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FAMILY ECONOMICS INVESTIGATIONS

Family economics investigations are concerned with the consumption of food and other agricultural products by rural and urban families and with levels of living achieved by rural families. Studies rely primarily on data collected from families and secondarily on analysis of consumption data from other sources.

Results of these investigations serve many different groups of people: administrators and educators concerned with policies and programs that affect family living; research workers in agriculture, economics, and marketing; college teachers; extension staff, nutritionists, social workers, and others who deal with families; and homemakers.

FAMILY FOOD CONSUMPTION, ECONOMY, AND NUTRITIVE ADEQUACY OF DIETS

Purpose and Nature of Work

To provide information on food consumption of groups within the population, such as farm and urban families of different incomes and in different regions; to evaluate the nutritive adequacy of diets; to determine the relative economy of foods as sources of essential nutrients; and to prepare guidance materials to promote good nutrition, including food selection, management, and home production.

Surveys of family food consumption, expenditures, and practices in the purchase and utilization of food are made from time to time, and the data analyzed to show the importance of various factors affecting consumption and diet adequacy. Differences in diets and comparisons of them with known nutritional needs suggest ways in which changes in consumption are desirable, also changes that may develop as circumstances shift. The nutritive value of the per capita food supply is computed periodically from consumption data provided by the Bureau of Agricultural Economics. As a tool for diet appraisal and planning, tables of composition and nutritive value of foods are compiled from published and unpublished sources.

Food budgets for families or other consuming groups are prepared, taking into account current information on nutritional requirements, food habits, food supplies, and prices. The resulting diet plans provide acceptable menus as well as adequate nutrition. The costs of these food budgets are estimated periodically. Food management guides and reports giving facts for some of the more important foods are also developed.

Currently Active Line Projects

Food consumption of urban and rural families. To obtain and analyze information on consumption of food by urban and rural families, as a basis for estimating current and potential outlets for agricultural products, for developing programs to expand consumption and improve nutrition, and for comparing the food consumption patterns and dietary levels of urban and rural families. (Rural investigations: Cooperative, Southern region; in part contract, Iowa)

Currently Active Line Projects (Cont'd)

Nutritional analysis of the United States per capita food supply - 1909 to present. To keep current a year-to-year series of data from 1909 showing the nutritive value of the civilian per capita food supply.

Nutritive value of homemakers' diets. To study the nutritive value and adequacy of homemakers' diets, as evidenced by menus reported for one day, investigate some of the factors affecting these diets, and determine the share of nutrients contributed by each of the day's meals.

Patterns of food use. To analyze patterns of food use and determine the competing or complementary nature of certain foods by studying the frequency of their use in city family meals, in order to help families in planning food purchases, home economists in recipe and menu development, and research workers in interpreting findings on the nutritive value of foods.

Food management guides for use by employed homemakers. To develop guides for the selection and management of nutritionally adequate family diets, for use by employed homemakers with limited time to spend in meal preparation.

Food budgets for use with restricted supplies. To translate into food quantity budgets the suboptimal nutrient allowances formulated by the Food and Nutrition Board, for use under conditions of restricted supply.

Food composition data on better-known nutrients. To keep up to date the index to data reported in current scientific literature and from available unpublished sources on the composition of foods and to prepare special summaries of data on the better-known nutrients in foods.

Data on amino acid content of foods. To summarize data from published and available unpublished sources on the amino acid content of foods, for use by nutritionists, physicians, administrators, and others needing it for planning and appraising dietaries and food supplies.

Commodity source materials for consumer educators. To prepare source materials on foods as marketed, for use in educating consumers to use abundant foods to best advantage and to conserve those that are scarce.

Brief Summary of Previous Work and Current Needs

Food consumption of family and institutional groups has been a research concern of the Department for more than 50 years. Studies made before 1900, during World War I, and in 1934-36, in 1935-36, in 1942, together with those of urban diets in 1948-49 have provided extensive information on family food consumption classified by family income, size, and by place of residence. For each of these surveys, the quantity of foods consumed has been evaluated with respect to nutritive content, probable adequacy, cost, and other important factors. Such information is basic to the development and evaluation of programs to improve nutrition, to expand outlets for agricultural products, and for the formulation of policy in production, distribution, and household utilization of food.

Brief Summary of Previous Work and Current Needs (Cont'd)

Information on food consumption of rural families is available on a Nationwide basis for no date later than 1942. New foods have come on the market, food habits have changed, and the economic situation of farm families and the composition of the rural population are now markedly different. Data collected in 1942 are becoming increasingly obsolete as a basis for estimating the current consumption of rural families, and in guiding educational programs and administrative action. Current work in a few counties is being supplemented by a Southern regional cooperative study in three types of farming areas, and a study in the North Central region is being developed.

Further tabulation and analyses of the data already collected on city family food consumption are needed. Most of the primary data available from the city surveys made in 1948 have been released in processed form in order to get results to the public quickly. These should be printed in order to make the data more conveniently and permanently available through libraries to research workers and administrators. Further analysis of these data to show trends and the factors related to variations in consumption should be carried on.

Household practices in the use of foods in the home should be determined through field surveys of the specific uses made of selected foods, the quantities used in various ways, and the relationship of these practices to such factors as family income, region, and education. For foods such as dairy products, fats and oils, eggs, and sugar, which have multiple uses in household food preparation and service, marketing specialists want to know the quantities used in the various forms marketed, to show ways of increasing consumption. For instance, how much fluid, evaporated, or dry milk goes into beverages; how much to cooking and other uses. The data would indicate the extent to which one food is substituted for another, as various fats for butter in table use and cooking and which of the fats families use in cooking different foods. For fruits and vegetables, information on the amounts and kinds eaten raw or cooked is needed for estimating the nutritive value of the food people actually eat.

Additional problems in family food consumption are: household food waste; the importance of food eaten away from home to family food supplies and to the nutritional content of diets; the division of nutrients among family members and among the day's meals.

Tables of composition and nutritive value of food, used as a tool for guiding production and utilization of food and appraising the nutritive content of diets, were compiled by the Department prior to 1900. Since its establishment in 1923, the Bureau has continued to expand such tables and keep them up to date by compiling and evaluating data on food composition from the world's scientific literature. With changes in the forms in which food is made available to the consumer, the discovery of new food elements, and the greater precision of scientific methods, this aspect has grown in scope and exactness. For example, a report published in 1896 gave facts about food composition in terms of 5 constituents; 14 were covered in 1950 edition of food tables, and work is underway toward adding more. The human body is now known to require more than 40.

Brief Summary of Previous Work and Current Needs (Cont'd)

different nutritive substances from its food, and undoubtedly others will be discovered. Eventually, food tables must report in terms of all essential substances and their availability.

Food budgets in terms of major groups of food to provide for nutritional needs of individuals and groups at various cost levels were first developed in the Bureau in the early 1930's. These have been revised from time to time to keep pace with advancing nutritional knowledge, and with changes in food supplies, home food production practices, and food habits as shown by dietary studies. These plans are used not only by families but by nutritionists, teachers, welfare agencies, and administrators concerned with food needs of civilians. Recently, these food plans have been adapted to special family types and to institutional use. More work is needed to help consumers on problems of food and money management in relation to better nutrition.

Examples of Accomplishment

Food consumption surveys - 1935-36, 1942, 1948. The first two surveys provided information on the total population, the third on city families. The publications resulting from these surveys are a primary source of statistical data on family food consumption, and are widely used by economists and market analysts. In addition, analyses of the data have been used in programs of nutrition education and in the determination of public policy. For example, the estimates of civilian food requirements for World War II and the knowledge of family food habits basic to the rationing system depended on these findings. Estimates of future demands and of potential needs for food also have taken account of current consumption and areas of nonconsumption, as shown by these surveys.

Appraisal of adequacy of U. S. diets. An appraisal of the dietary situation in 1935-36, as revealed by records of family consumption, indicated important dietary weaknesses and gave impetus to the National Nutrition Program launched in 1941 as a part of defense planning. It also pointed up the need for specific measures such as nutrition education, enrichment of bread and flour, and school lunch and other programs to get more and better food to the people with poor diets. Currently, the dietary situation is under continuous review both through periodic estimates of the nutritive value of the National food supply and through interpretations of studies of family food consumption in the light of human nutritional needs.

Formulation of family food plans and budgets. Developed around a dozen nutritionally significant food groups, practical food plans for families were first presented in the early 1930's, notably in the technical publication, "Diets at four levels of nutritive content and cost." Later successive editions, taking account of advances in scientific knowledge and changed food supplies, went to the public in more popular form, such as "Food for families with school children." Guidance material for teachers and social welfare workers was also prepared, such as the bulletin "Helping families plan food budgets."

Examples of Accomplishment (Cont'd)

Evaluation of methods of studying family food consumption. Methods of obtaining data sufficiently accurate to evaluate the quality of diets have been a continuing problem. At the request of the National Research Council's Food and Nutrition Board, a review and evaluation of commonly used methods was made in 1947. In 1948 a working conference on methods of studying food intake was held with experiment station workers who were engaged in cooperative studies of diet and nutritional status.

Development of tables of food composition. A publication which summarizes scientific data on 751 foods, in terms of water, food energy, protein, fat, total carbohydrate, fiber, ash, three minerals, and five vitamins, was issued in 1950. Titled "Composition of foods, raw, processed, prepared," this bulletin replaces a succession of earlier Departmental bulletins now outdated by new scientific work. It becomes the standard reference on composition and nutritive value of food for dietitians, teachers, nutritionists, and for those in medical practice who are guiding food selection and appraising diets. The data are also used in estimating the nutritive value of available food supplies and the relative economy and nutritive value of various food products - an important task in effective food management. A special edition including 12 components of military rations was prepared for the use of Armed Forces in 1951.

FAMILY BUDGETS AND CONSUMPTION OF GOODS AND SERVICES

Purpose and Nature of Work

To provide information on the consumption of goods and services in rural families; to appraise the levels of living achieved and compare these levels with those of other population groups; to determine the economy of various management practices in the home; and to analyze effects of family purchases and the use of products on the family living and on the demand for agricultural products.

Data on quantities of goods and services purchased, inventories, and expenditures in relation to income, savings, and family characteristics are obtained directly from families through field studies, from family records and account books kept over a number of years by farm families in various States, from the Agricultural and the National Census, and from other appropriate sources.

These figures are analyzed to determine trends and the relative importance of factors associated with variations in consumption. Findings are interpreted in the light of changing economic conditions. Levels of living are appraised, and guidance material on family budgets developed.

Currently Active Line Projects

Rural family living and outlook reports. To prepare materials for and to participate in the annual Outlook Conference conducted by the Bureau of Agricultural Economics and the Bureau of Human Nutrition and Home Economics for the Extension Service, and through quarterly reports to continue this outlook service through the year for home economists of the Extension Service and Farmers Home Administration and college teachers in home economics.

Farm family living in Illinois in 1946. To obtain basic statistical data on Illinois farm family expenditures for living and on savings, in relation to income (gross and net farm income, family money, and nonmoney income); and, by comparing these data with those obtained from farm household accounts submitted to the University of Illinois, to devise a means for extending the usefulness of these annual account data for the analysis of trends in farm family spending. (Cooperative: Illinois)

Farm family living in four Kansas counties. To compare the kinds and quantities of goods purchased for family living and the levels of living achieved by farm families in four counties in Kansas at two periods (1935-36 and 1948-49) and to relate changes in the character of consumption to changes in income, prices, and the community situation.

Farm family expenditures in Montana. To determine expenditures for clothing, food, furnishings, equipment, and household operation by farm operator families in Montana for 1949-50. The primary purpose of the study of which this is a part is to provide consumption weights for an index of prices paid by farmers, to be computed locally. Data will also contribute to the knowledge of rural family consumption. (Cooperative: BAE)

Currently Active Line Projects (Cont'd)

Estimates of home food preservation. To estimate the kind and amount of food preserved at home in order to supply data for decisions on requirements of strategic materials for home food preservation, such as rubber jar rings, closures, jars, cans, pressure and water-bath canners, and freezer packaging materials.

Survey of inventories and purchases of clothing by families. To collect data by field surveys on family inventories and annual purchases of all items of clothing, and to analyze the data for factors causing variations and trends.

Money management guides for employed women in Washington, D. C. To prepare aids for budgeting living expenditures of women employed in Washington, for use by teachers and other counselors.

Brief Summary of Previous Work and Current Needs

Work in the broad field of family economics begun earlier by the Office of Home Economics has continued. Original data on family expenditures, quantities purchased of various types of goods and services, and related practices of farm families were collected in the 1920's in cooperation with the Bureau of Agricultural Economics and in 1935-36 and 1941-42 in cooperation with the Bureau of Labor Statistics. Since 1941-42, a number of smaller consumption surveys covering limited geographic areas and types of families have been made in cooperation with various State groups. Under this project clothing and housing have been studied both in separate surveys and as a part of general studies of household consumption, with information obtained on ownership, use, and purchase.

Guidance to leaders of rural groups on family financial management has long been given. Since 1932 the Bureau has cooperated in the Annual Outlook Conference, and since 1943 has supplied to home economists a monthly or quarterly publication summarizing economic trends affecting family living.

Periodic surveys on a regional and national basis of the consumption of all goods and services are needed to determine the effect on rural family living of economic, social, and technological changes such as shifts in population, changes in the level and distribution of income, the increase in the number of farm homes electrified, and changes in prices and kinds of goods available. Data and analyses from surveys are used by producers and businessmen concerned with present and potential utilization of goods and services in family living, and by educators and administrators in developing programs and policies affecting the welfare of rural families.

Extension of work is needed to obtain from other localities the information now being secured from three localities on clothing inventories and purchases. In addition, corresponding information on household textiles is needed. On a broad scale such data are useful, whether consumer markets need expansion or curtailment. In a national emergency, for example, information on family clothing and household textile inventories would be wanted as it was during World War II, in order to estimate the extent to which production could be directed to noncivilian materials.

Examples of Accomplishment

Appraisal of materials and methods in research on family living. In cooperation with the Social Science Research Council and the Institute of Pacific Relations the Bureau prepared a source book on family living research, evaluating techniques and summarizing findings. This study of family living in the United States and other countries, published in 1935, is still the basic source of such historical data. The evaluation of methods set the technical pattern for the large-scale work later undertaken by the Department of Agriculture and the Department of Labor.

Nation-wide surveys of rural family spending. Surveys of rural family expenditures for the complete range of consumer goods and savings have twice been made on a Nation-wide scale. The Consumer Purchases Study (1935-36) provided data on income for nearly 50,000 rural families and data on expenditures and savings for more than 25,000 rural families. Findings, published in 23 volumes, have provided basic statistical information on income, expenditures, and savings that have been widely used by legislators, administrators, educators, and specialists in marketing.

At the outset of World War II a second such rural survey was undertaken. This survey was designed to provide information on then-current family expenditure patterns and levels of living, needed to answer administrative questions on civilian requirements. The rural sample of 1,800 families was smaller than for the Consumer Purchases Study, since emphasis was on reporting the current over-all situation.

Both in 1935-36 and 1941-42, paralleled and coordinated work of the Departments of Agriculture and Labor made possible comparisons of levels of living of the rural and urban population and estimates of family income, expenditures, and savings for the total population. In addition to their original purpose of giving administrators needed information on family spending, saving, and levels of living, these data have provided materials for basic economic analyses. They have also had wide use in statistical work, as for example, supplying the family expenditure weights for the Index of Prices Paid by Farmers (BAE). A further end-product of research on family expenditures and savings is material useful to families and to those who work with families in budgeting problems. Findings of these family expenditure surveys have been used in publications on family financial planning prepared for the use of the Extension Service and for distribution to the public.

Economic outlook for family living. The Annual Outlook Conference provides a means of getting research results to rural families through home economists of the Extension Service. A chartbook prepared for each conference contains about 30 charts and shows the situation and recent changes in rural living conditions, as well as trends in prices and other economic conditions that affect family living. During World War II a monthly report, "Wartime family living," and in recent years a quarterly report, "Rural family living," have been issued to supply current economic information to those who work with families. Both the chartbook and quarterly reports are distributed to home economists of the Extension Service and the Farmers Home Administration and, on request, to college teachers, research workers, and administrators.

TEXTILE AND CLOTHING INVESTIGATIONS

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TEXTILE AND CLOTHING INVESTIGATIONS

The Bureau's research in textiles and clothing seeks to develop facts that will assist in the most effective utilization of the country's fiber resources. It provides information about fabrics, clothing, and household textile furnishings that guides homemakers in the selection, construction, use, and care of these articles for their families. In addition, manufacturers use the findings in improving textiles and products put on the market for consumer use, and governmental and other agencies use them as a basis for fabric and clothing specifications.

PROPERTIES AND DESIGN OF FABRICS, GARMENTS, AND HOUSEHOLD TEXTILES IN RELATION TO SELECTION, CONSTRUCTION, USE, AND CARE

Purpose and Nature of Work

To evaluate fabrics, clothing, and household textile items available to consumers on the retail market as to suitability for consumer use; to determine characteristics and qualities that make for satisfaction during use; to develop designs for utility garments to meet specific needs of the wearer; to devise improved techniques for home construction of textile articles; and to develop improved procedures for home care of the family's clothing and textiles.

Fabrics, ready-made clothing, and textile furnishings currently available to homemakers at retail are studied to learn chemical and physical properties, reaction to various methods of cleaning, and susceptibility to deterioration by such agents as light, heat, acid, alkali, abrasion, and microorganisms. New types of fabrics are analyzed for success and permanence of special finishes, ease of cleaning, special handling required, and construction techniques best suited to such materials. Various kinds of ready-made clothing and household textiles are examined and the advantages and disadvantages of different features of construction appraised with a view to assisting consumers in the selection and care of such items. Research findings are made available to consumers, extension leaders, and other educators, and to research workers through publications, film strips, loan exhibits, radio, and television.

Currently Active Line Projects

Properties and serviceability of clothing and household fabrics. To compile data on physical properties and serviceability of clothing and household textiles to guide in developing specifications for the manufacture of staple fabrics for civilian needs in time of national emergency and in allocating textile fibers and yarns for production of essential civilian textiles.

Dimensional stability and elastic properties of knit fabrics. To determine type of construction and fiber composition of knitted clothing fabrics which will produce maximum dimensional stability and elasticity.

Currently Active Line Projects (Cont'd)

Sizing systems for garments and patterns. To improve the system for sizing children's and women's garments and patterns, using as a basis body measurements which reflect physical development.

Buying guide for women's coats and suits. To develop a buying guide that will enable women to select coats and suits best suited to individual needs considering prices they can afford to pay.

Buying guide for clothing and household fabrics. To prepare a practical guide to aid homemakers and extension leaders in the identification, selection, and wise utilization of fabrics made from various fibers.

Care and restoration of the family's clothing. To develop practical guides for the care and repair of the family's clothing, including accessories.

Efficiency of soaps and synthetic detergents in removing soil from fabrics. To compare the efficiency of soaps and synthetic detergents in removing soil in the home laundering of clothing and household fabrics when washing in waters differing in hardness, at different temperatures, and for different lengths of time, in order to provide a factual basis for guiding selection and use of these products.

Effect on clothing and household textiles of repeated home laundering. To determine the change in fabric properties resulting from repeated laundering with different concentrations of various soaps and synthetic detergents, with and without builders (chemicals that improve cleaning action and help soften the water), in waters of different temperatures and degrees of hardness.

Home disinfecting of fabrics. To compare the effectiveness of various concentrations of household and commercial laundry disinfectants used to destroy or prevent the growth of microorganisms commonly found on soiled clothing.

Deterioration by microorganisms of clothing and household textiles. To determine the nature of, and to develop methods of preventing, deterioration caused by microorganisms in clothing and household textile furnishings containing wool and related fibers such as those made from the proteins of milk, soybeans, and peanuts.

Exhibits to supplement printed publications. To make available to extension workers, teachers, and other leaders in home economics, loan exhibits and other subject-matter aids that will supplement printed publications of research findings.

Home construction of clothing. To develop sewing procedures which will enable home sewers to construct simple and durable clothing for the family with a minimum expenditure of time and effort.

Brief Summary of Previous Work and Current Need

In the 1920's research on cotton and wool fabrics was focused on selection and ways of caring for them so as to increase consumer satisfaction and use of domestic cotton and wool fabrics. Later, studies of the properties of woven and knitted fabrics that make them suitable for specific consumer requirements were made. Because of continuous development and introduction into retail channels of new textile fibers and fabrics, with and without special finishes, and of products for use in caring for these materials, there is continuing need for research to provide the homemaker with a basis for choosing suitable fabrics for clothing and household textiles, including shoes, carpets, and rugs, and for selecting home methods for properly caring for and reconditioning them.

Research pertaining to the body measurements of women and children was initiated in the 1930's to provide a scientific basis for the development of improved systems for the sizing of apparel for these groups. This is now finding its way into practical use by manufacturers. Similar work is needed to improve sizing of footwear.

More recently initiated are studies of the suitability of various construction features used in one type of cotton utility clothing, in order to develop standards of construction for such garments, and to develop buying guides for the use of consumers selecting them.

Examples of Accomplishment

Development of designs for functional clothes for women and children has resulted in new types of garments and created demands for new fabrics especially suited to the designs. In the late 1920's, for example, clothing specialists pioneered in designs for children's play clothes. Two new types of garments were introduced -- sunsuits that provided for direct sun rays and one-piece snow suits that simplified dressing and undressing small children. Prior to this work such garments were entirely unknown in children's wardrobes and to the clothing trade. Today a number of manufacturers make such items and many of them use the fundamental principles of children's functional clothing developed by the Bureau.

During World War II, research on women's work clothing established standards of design that provided for the wearer's comfort and safety, took into account convenience in dressing and simplicity of design, and used material and construction best suited to the wear and care to be given the garment. For these as with other functional designs developed by the Bureau, commercial companies have put out patterns made from laboratory patterns supplied them. Manufacturers of ready-to-wear garments have incorporated many features of the designs in their products. Teachers have made wide use of the designs and the principles on which they are based. Patterns have also been supplied to manufacturers, nursery school directors, and teachers in New Zealand and Australia.

Examples of Accomplishment (Cont'd)

Increased utilization of cotton and wool for clothing purposes resulted not only from the origination of the two new types of play garments for preschool children - cotton sunsuits and wool snow suits, but retailer and consumer demand for fabrics used in experimental protective garments has induced fabric manufacturers to put new types of shower-resistant cottons on retail markets.

With the aim of increasing the use of cotton, Congress requested research to develop more satisfactory cotton hose for women. More than 250 designs suitable for women's full-fashioned hosiery with construction details were ready for release just as the silk shortage of World War II became critical. Manufacturers put several of the designs into immediate production. Actual wear studies on some of the designs showed cotton hosiery made of long-staple fiber pre-eminently suited to needs of nurses, waitresses, and beauty shop operators. Later studies showed that by giving yarns of short-staple cotton certain chemical finishes, hosiery could be made that was superior in appearance, bursting strength, elastic properties, and abrasion resistance to hose knit from untreated short staple yarns.

Development of effective mildew-resistant treatments for cotton fabrics reduced the enormous yearly loss of cotton household fabrics from mildew. More than 250 chemical treatments were evaluated for their effectiveness in preventing mildew after laundering, weathering out-of-doors, and storage. As a result several treatments were developed for use on shower curtains, awnings, porch furniture fabrics, and similar items likely to mildew. A public service patent was granted for one treatment. Results of this research have also served in developing (with the informal cooperation of the U. S. Forest Service) treatments for preserving seed-bed cloth, and (with the informal cooperation of the Bureau of Entomology and Plant Quarantine) a treatment for rendering fabrics resistant to termites.

Development of buying guides for yard goods as well as finished articles resulted from laboratory analyses of various household and clothing fabrics and of ready-made garments currently available at retail. Cotton and wool fabrics, sheets, blankets, bath towels, window curtains, women's cotton housework dresses, slips, hosiery, and men's and boys' shirts and suits are among items discussed in the series of publications issued. Distribution of these buying guides has reached more than $2\frac{1}{2}$ million copies, most of which went to individuals requesting them.

Formulation of tentative specifications for fabric for consumer use, issued by the American Society for Testing Materials to help manufacturers produce more acceptable articles, resulted from analyses of properties of various household and clothing textiles. Among specifications developed are those for bleached wide cotton sheeting; all-wool, all-cotton, and wool and cotton household blanketeting; terry (Turkish) toweling; all-cotton upholstery tapes-tries; medium-weight cotton corduroy; and bleached cotton broadcloth. These specifications provide information fundamental to the factual labeling of fabrics as well as for consumer buying guides. The latter have been developed for sheets, blankets, bath towels, and for cotton shirts for men and boys.

Examples of Accomplishment (Cont'd)

Collection and analysis of body measurements for children and women completed in 1941 provided the basis for developing a practical and scientific system of sizing garments and patterns, thereby helping to overcome waste due to misfits and returned goods. Retailers estimate that millions of dollars worth of children's clothing alone is returned annually to retail stores because of wrong size -- a situation resulting largely from a lack of standardization of sizes. The Bureau's proposal for the improved sizing of garments has been accepted by several branches of the children's apparel industry. Currently, work is under way in cooperation with the National Bureau of Standards and one segment of the ready-to-wear trade on developing a system of improved sizing of apparel for women and teen-age girls. In addition to their use in the United States, results of this statistical study are being used as a guide by research workers in Sweden and The Netherlands in developing sizing standards for the apparel industries in those countries.

Development of minimum standards for clothing construction provided the basis for the section on construction in the recently approved (June 1950) American Home Economics Association Standard for cotton housework dresses. The research has also been concerned with the relative performance of important details of construction in men's work and business shirts and pajamas.

Guidance in clothing conservation was an aid in keeping families comfortably and adequately clothed during World War II. During those years when the market offerings of civilian fabrics and garments, particularly those for children, were few, attention was given to devising make-overs from discarded articles. That this research met a real need is shown by many reports from homemakers and by the fact that more than one and a half million copies of publications on clothing conservation were distributed, largely upon individual request. The Extension Service made wide use of results of this research in this country. England also used them; one Department publication was reprinted in that country in the official organ of professional home economists.

Furtherance of home sewing through the development of new procedures and the adaptation of commercial techniques to the home dressmaker's equipment and facilities has helped women to produce at home garments of high quality and professional appearance, thus providing for themselves and their families clothing of better fabrics at a lower price than would otherwise have been possible. More than $2\frac{1}{2}$ million copies of home sewing publications had been distributed up to July 1951.

UTILITY OF FABRICS OF KNOWN COMPOSITION, CONSTRUCTION, AND FINISH

Purpose and Nature of Work

To compare, in the laboratory and under conditions of actual use, the wearing qualities of woven clothing and household fabrics of known and controlled composition and construction.

Garments and finished articles are made and put into use under controlled conditions. Fabrics used for these investigations are provided under service contracts or by cooperating agencies, in accordance with established mill procedures. Cotton used is of known variety, grade, and staple length. Wools are of known history and fineness. Other fibers and yarns are selected in accordance with prevailing mill practices for such materials. Specifications for manufacturing yarns and fabrics are developed cooperatively by agencies participating in the project and adhere closely to those customarily employed in commercial production of such materials. Records are kept of the wear each article receives and specimens are withdrawn periodically for analysis of amount and rate of deterioration. Results provide the factual basis needed to develop consumer standards for staple fabrics, to guide manufacturers in the production and informative labeling of goods, and to help consumers in their buying.

Currently Active Line Projects

Serviceability of utility percales. To determine by wear tests of work dresses the relative serviceability of three qualities of percale composed entirely of cotton.

Usefulness of cotton and manufactured fibers in household and clothing fabrics. To determine the serviceability of bed sheeting composed entirely of cotton, entirely of viscose staple rayon, and of various combinations of the two.

Serviceability of wool and part-wool suitings. To determine by wear tests the relative usefulness of suitings composed entirely of wool of different grades, and to study the effect of replacing part of the wool with other fibers on wearing qualities and consumer acceptability of the fabrics.

Effect of aging wool on the serviceability of fabrics. To determine through wear tests the serviceability of fabrics made from wool yarns that have been aged for various lengths of time during important steps in their manufacture.

Brief Summary of Previous Work and Current Need

A few studies of the performance-in-use of fabrics manufactured according to specifications have been made, but the potential usefulness of cotton and wool of various grades, lengths, and fineness has never been fully examined. How well fabrics of known composition and construction meet requirements of families should be determined by systematic research, including in-service evaluations of the most promising fabrics. These should include: further studies of the effect of yarn and fabric construction

Brief Summary of Previous Work and Current Need (Cont'd)

on the wearing quality and other characteristics of fabrics; the effectiveness and permanence of finishes used to improve the natural characteristics of cotton; evaluation of the use of manufactured fibers in floor coverings; and the serviceability of more fabrics made from wool blends and from blends of wool with other fibers, as well as types of fabric construction, than have been studied to date.

Examples of Accomplishment

Comparative serviceability of medium- and heavy-weight bed sheets was determined through studies that yielded the first information ever obtained on the service life of bed sheets made from fibers and fabrics of known composition and construction. Medium-weight muslin sheets made from Good Middling and Middling cotton of 1- and 1-1/32 inch staple length, respectively, were found to wear an average of 16 percent longer than similar sheets made from Strict Good Ordinary cotton of 1-inch staple. Heavy-weight muslin sheets made from 15/16 to 1-inch Middling cottons withstood, on the average, between 276 and 281 use-periods (period of wear followed by laundering); medium-weight muslin sheets made from American Upland cotton of the same grade and staple length withstood an average of 239 use-periods.

Evaluation of sheetings composed entirely of cotton, entirely of staple viscose rayon, and a mixture of the two fibers was made shortly after the close of World II, when sheets made of part cotton and part rayon appeared on the retail market. In a laboratory comparison of sheetings identical in yarn and fabric construction, those composed entirely of cotton were found to be better in breaking strength, resistance to abrasion, resistance to damage in laundering, and in dimensional stability than those composed wholly or in part of viscose staple rayon. All-cotton sheets shrank approximately 7-1/2 inches (7 percent) in length; all-rayon and part-rayon, about 19 and 13 inches (18 and 12 percent), respectively. This study, still in progress, is providing the first factual information ever obtained on the comparative serviceability of cotton sheetings and sheetings from other fibers.

Evaluation of the serviceability of all-wool blankets made from three blends of wool is believed to be the first study in which fabrics made according to specification of wool of known history were put into use and the rate and nature of their deterioration studied at various stages throughout their wear life. This research was reported in a USDA technical bulletin in 1937. Both service and laboratory tests showed that about the same service was had from the fabric composed of one part fine and one part one-half blood wool and from the fabric composed of two parts three-eighths blood and one part one-fourth blood. Wool blankets containing one part three-eighths blood and two parts of reworked wool had a significantly lower serviceability than the first two. This research and a subsequent study, published in 1943, of the serviceability of blanket fabrics made from varicus blends of wool and mohair and additional laboratory studies of the physical properties of 44 representative household and camp blankets, formed the basis for recommended minimum specifications for household blankets that would give satisfactory consumer service.

HOUSING AND HOUSEHOLD EQUIPMENT INVESTIGATIONS

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HOUSING AND HOUSEHOLD EQUIPMENT INVESTIGATIONS

Housing and household equipment investigations seek to aid consumers in selecting and using household equipment best suited to the purpose for which it was designed, and to improve the efficiency and livability of farm homes by developing house plans based on family needs.

OPERATING CHARACTERISTICS AND PERFORMANCE REQUIREMENTS OF HOUSEHOLD EQUIPMENT

Purpose and Nature of Current Work

To develop standards of performance for major types of household equipment suited to the requirements of the household activity for which each is used, and to compare the operating characteristics of various types and designs of household equipment.

Studies are being made of the requirements of the major household operations in which equipment is utilized and of the performance-in-use of various types and designs of equipment currently on the market. Based on these results, economically and structurally feasible performance standards will be developed in cooperation with specialists in foods, textiles, and other home economics fields. Various types of construction and design of household equipment are studied by engineering tests to determine operating characteristics under controlled conditions. Designs are developed for home-built equipment of types which are not available commercially or, if so, are too costly for wide use.

Findings are presented in popular bulletins for the consumer on the selection, operation, and care of equipment, and in technical and semi-technical reports for the use of manufacturers in improving designs of household equipment as well as for educational and other agencies working in the field of equipment. Findings also are incorporated in specifications and standards for use in procurement by the Federal Government and other purchasing agencies.

Currently Active Line Projects

Operating characteristics and use of modern domestic washing machines. To study operating characteristics of modern home washing machines as they are affected by machine design, size and kind of washing load, quantities and temperature of water, length of washing period, quantity of detergent, and other related factors, in order to establish performance requirements for the guidance of manufacturers in developing new models, and to develop procedures for the efficient use of washing machines in home laundering.

Currently Active Line Projects (Cont'd)

Development of designs for home-built refrigerators. To develop designs for home-built, multiple-temperature, walk-in refrigerators based on performance requirements and on farm family needs for storing perishable foods, and to prepare working drawings and specifications for their construction. (BPISAE)

Specifications for purchase of household equipment. To prepare specifications for electric ranges, refrigerators, freezers, hand irons, hot plates, and fans, in order to help consumers and procurement officers in buying such equipment and to assist manufacturers in improving designs.

Comparison of fuels. To determine the relative efficiency of utilization of liquefied petroleum (bottled) gas and electricity in home cooking, refrigeration, and water heating. (Supported in part by a Trust Fund from industry)

Brief Summary of Previous Work and Current Needs

Studies on household equipment were started by the Bureau in 1934. In the early development of household equipment, design engineers gave major attention to mechanical efficiency and, in the case of heat-producing equipment, to thermal efficiency. More recently they are recognizing the importance of the performance of the equipment under conditions of home use and are asking home economists for information on the performance requirements of household equipment in terms of the needs of the specific jobs to be done. To date the Bureau has developed standard test procedures for household refrigerators, home freezers, and electric and gas range ovens. Performance requirements have been established for range ovens and home freezers, and a multi-purpose walk-in refrigerator with emphasis on functional factors has been designed and built. It is now being studied in respect to performance in use.

Information on the operating characteristics of types and designs of household equipment is needed as a basis for (1) assisting homemakers to select equipment to meet their needs, to use it efficiently, and to care for it properly; (2) assisting with the formulation of standard specifications for equipment; and (3) furnishing technical and semi-technical information to educational and other agencies working in the field of household equipment.

Examples of Accomplishment

Initiation of a program to standardize testing procedures, such as is now carried on by the American Standards Association, may be credited largely to Department activities. About 20 years ago, the Bureau asked that a committee be set up by the American Standards Association to formulate standards for household refrigerators. This committee, in which the Bureau took leadership, was the first ASA household-equipment committee to be created.

Examples of Accomplishment (Cont'd)

The Bureau also developed the first test procedures proposed for home freezers, many features of which have found a place in the proposed standard test procedures for home freezers of the American Society of Refrigerating Engineers and of the American Standards Association. In addition, the Bureau cooperated in the development of American standard test procedures for electric and gas ranges, electric water heaters, and hand irons, and these tests are being used by manufacturers in developing designs for equipment.

Leadership in developing standards of performance which household equipment should meet has been taken by the Bureau. Temperature requirements for maintaining desirable quality in foods stored in household refrigerators and in home freezers have been established, and industry is developing equipment to meet these. Upper and lower limits of acceptable browning have been established for products baked in an electric-range oven, and a set of color charts ranging from colors slightly lighter and somewhat darker than the acceptable limits in browning have been prepared to provide a simple, inexpensive tool for judging oven performance.

Buying guides and directions for use and care of household equipment have been prepared to assist consumers in selecting equipment to meet their needs, using it efficiently, and caring for it properly. During World War II, a series of 8 leaflets covering important household appliances was prepared to help families extend the life of these scarce items through proper use and care. These publications also served as teaching aids in high schools, colleges, and adult education classes.

Design for a walk-in refrigerator has been developed based on certain known functional requirements and tested under controlled conditions. Laboratory studies showed only a slight difference in initial and operating costs between a two-temperature refrigerator using two compressor units, each selected to carry the load of a single compartment, and a similar refrigerator using a single compressor unit, selected to carry the entire load. This is significant because either of the smaller units will maintain low enough temperatures in each compartment to minimize the possibility of food loss should one of the units fail. Field testing of two such walk-in refrigerators under actual use conditions was initiated in 1951.

**RURAL HOUSE REQUIREMENTS AND DESIGNS
FOR EFFECTIVE USE OF SPACE AND FACILITIES**

Purpose and Nature of Current Work

To determine the family-living requirements of rural housing; to develop design standards which will provide for efficiency in household operation, livability, and economy in construction; to evaluate the suitability of materials used for interior finishes; to develop house plans well suited to family needs.

Working and storage space required for various household activities, efficient arrangements of space and equipment, and functional designs for built-in facilities are being developed in the laboratory, taking account of information available or to be obtained on the type and scope of household activities of farm families and of the amount and kind of family possessions requiring storage. Different arrangements of work space and installed equipment and varicus designs for built-in facilities are evaluated by time and motion studies and other methods found applicable. Results will be incorporated into house plans, and also published in technical and popular reports.

Currently Active Line Projects

Analysis of farm household activities as a guide to housing needs. To secure and interpret data on the type and scope of household activities which affect space requirements, on family possessions requiring storage, and on family preferences for certain housing features and for the location of activity areas. These data are basic to the development of space standards for activity areas and to designing houses that meet family needs. (Cooperative: 11 States in Western Region, 5 in Southern)

Housing facilities for home food preservation. To determine work space requirements for home food preservation and efficient arrangements of work space and installed equipment for this activity, and to develop functional designs for the storage of processed foods and of utensils and supplies used.

Housing facilities for construction and repair of clothing and household textile articles. To determine space requirements for the construction and repair of clothing and household textile articles, plan efficient arrangements of equipment and space for sewing, and to develop functional designs for the storage of sewing supplies. (Cooperative: Pennsylvania)

Farmhouse plans for regional exchange service. To develop new farmhouse plans incorporating findings of recent research, such as that on the housing needs of farm families in various regions of the United States, and to revise, prepare, and publish collections of plans from which farm families in different parts of the country may make selections to meet their needs. (Cooperative: EPISAE)

Brief Summary of Previous Work and Current Needs

Research in rural housing was started by the Bureau in 1934 when, in cooperation with other agencies of the Department, a survey was made to obtain information on housing conditions and the potential demand for improved home facilities of the farm.

Following World War II to meet the urgent demand from farm families for help in planning house remodeling and building, the Bureau in cooperation with the Bureau of Plant Industry, Soils and Agricultural Engineering, prepared a series of bulletins, summarizing existing information on those subjects. A group of new house plans incorporating available information on functional housing was also developed. These plans were used largely in revision of the Northeastern Regional Plan Service Catalogue.

Four regional field studies, started in 1948 in cooperation with 29 State agricultural experiment stations, have provided essential information on the kind and extent of major household activities, the kind and amount of household possessions requiring storage, and the families' preferences for location of activities and for certain housing features. Results of these surveys are being used in laboratory studies to establish the amount of space and the dimensions most satisfactory for carrying on various types of household work. Such research should be expanded.

The need for more adequate housing is shown by the census of 1950 which reports 21 percent of farm houses as dilapidated as compared with only 6 percent of urban dwellings. All studies indicate the interest of farm families in home improvement but actual accomplishment is possible in many cases only if house plans call for relatively low cash expenditures. The development of designs for farm houses that will provide for more efficient household operations and greater livability for the family require a knowledge of space requirements and functional use, as well as an evaluation of interior finishes - all of which can be obtained only through research.

Examples of Accomplishments

The Nation-wide survey of farm housing conditions in 1934, covering about 596,000 farmhouses in 46 States, gave the first detailed description of farmhouses and their equipment and revealed their needs for improvements. Results of this study pointed up needs for research in various phases of farm housing and for many years served as a guide for educational programs dealing with the improvement of rural housing.

Twenty-two plans for farmhouses have been developed since World War III in cooperation with the Bureau of Plant Industry, Soils and Agricultural Engineering and a bulletin illustrating them published. These plans, distributed by States in all regions, have been widely publicized in farm magazines and local newspapers. All regions report that these farm house plans have been their best sellers. Plans for 19 low-cost farmhouses have also been developed or revised for use in the program authorized by the Housing Act of 1949. They are widely used, too, by commercial organizations in preparing plans that show the use of various materials.

Examples of Accomplishment (Cont'd)

A series of planning guides entitled "Your Farmhouse" has been developed to meet the demand from farm families for help in planning and remodeling in the period just after World War II. Three guides have been issued; four more are to be completed. Since few researches have been made to assist in house designing for efficiency and livability, these publications were based largely on the experience and judgement of people working in the rural housing field. They were prepared in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering.

Functional designs have been developed for cabinets used in the three major work areas of the kitchen -- meal preparation, cooking and serving, and clearing and dishwashing. These designs are simple in construction and easy to follow and the working drawings of them can be used by families doing their own remodeling and by local carpenters unskilled in cabinet work. The construction drawings are being distributed through the regional plan exchange service. More than 600 sets of the drawings were sold during the first two years they were available.

Development of a step-saving U kitchen designed to assist homemakers in reducing time and effort spent in kitchen activities was based largely on studies of efficiency in arrangement of kitchen storage facilities. This kitchen was built and has been exhibited to many thousands of people. Pictures and plans of the kitchen have been published in newspapers and magazines throughout this country and abroad. Thousands of copies of the bulletin "A Step-Saving U Kitchen" have been distributed. Construction plans for the kitchen are sold through the regional plan service in the States. The Bureau has received many requests for information or blueprints from the 48 States, Alaska, Hawaii, Puerto Rico, and foreign countries. In Australia and Canada arrangements to distribute blueprints were made by local government agencies.

FOOD QUALITY

Apples

Edible apple tissue--proportion, cost, and palatability--in midwestern retail stores 1947-48 and 1948-49. R. A. Kelly. Ill. Col. Agr. AE-2801, 63 pp., illus. Apr. 1951. (N. Cent. Reg. Proj., BHNHE cooperating) (Processed)

Blemishes in midwestern apples--amount and causes, 1949-50. R. A. Kelly. Ill. Col. Agr. AE-2806, 39 pp., illus. (Undated rpt.) (N. Cent. Reg. Proj. BHNHE cooperating) (Processed)

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Cooking quality, specific gravity, and reducing-sugar content of early-crop potatoes. Mary E. Kirkpatrick, Beatrice M. Mountjoy, Linda C. Albright, and P. H. Heinze. Cir. 872, 22 pp., illus. July 1951. (Cooperative: EPISAE)

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The new (wartime) flour: Baking qualities. Mary T. Swickard. Jour. Home Econ. 38: 353-354. June 1946.

Report of the U. S. Department of Agriculture bread flavor committee. Florance B. King, D. A. Coleman, and J. A. LeClerc. Cereal Chem. 14: 49-58. Jan. 1937. (Cooperative: BAE, BCS)

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Palatability of experimental estrogen-treated turkey fryers. M. T. Swickard, E. H. Montague, E. F. Dochterman, and S. J. Marsden. Poultry Sci. (In press) (Cooperative: BAI)

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